

28. STUDIES ON THE BIOLOGY OF *ASPIDOMORPHA MILIARIS*
F. (CASSIDIDAE: COLEOPTERA) ON THREE SPECIES
OF *IPOMOEA* AND LEAF AREA CONSUMPTION
STUDIES ON *IPOMOEA ANGULATA* LAMK.

INTRODUCTION

Aspidomorpha miliaris F. is an important pest of sweet potato. Both adults and grubs feed on the leaves. David and Muthaiah (1960) and Reddy and Puttaswamy (1981) recorded this species on a number of species of *Ipomoea*. Baltzar (1974) reported its biology from Philippines and Gubbaih and Devaiah (1978) have studied the biology of *A. sanctacrucia* on *Ipomoea* sp. The biology of this insect on three different species of *Ipomoea* and the leaf area consumed by the different instars and adults on *I. angulata* were studied in the laboratory at Agricultural College, Dharwad, Karnataka.

MATERIAL AND METHODS

Pupae of *Aspidomorpha miliaris* F. were collected from the field during July 1984 and were kept in 8" petri dishes for adult emergence. After adult emergence five pairs of male and females were kept in five different 8" petri dishes for observations on mating, pre-oviposition and oviposition. The mated pairs were used for egg laying. The first batch of eggs (ootheca) laid by the mated pairs collected from *Ipomoea angulata* were kept separately in a 4" petri dish until hatching. On hatching the first instar grubs were transferred singly to petridishes containing fresh leaves of *Ipomoea angulata*, *Ipomoea palmata* Hort. and *Ipomoea batata* L. The experiment was conducted during July and August 1985 and replicated three times for biological studies and five times for leaf area consumption studies. Leaves of the food plants were renewed daily. Observations on different instars of

grubs, prepupal stage, pupal stage and adult stage were recorded daily. After emergence, mating period, pre-oviposition, and ovipositional period, number of ootheca laid by each female, post-oviposition period and fecundity were recorded. In case of leaf area consumption studies, area consumed by each instar grubs and adults were recorded by using planimeter. The male and female were identified during pupal stage. As grubs were reared singly, based on pupal stage identification, male and female leaf area consumption have been differentiated in grub stage itself.

RESULTS AND DISCUSSION

I. *Observation on field collected Beetles*

Five pairs of male and female beetles were kept separately in 8" petri dishes containing *Ipomoea angulata* leaves after emergence from field collected pupae. Duration of the mating was found to be quite variable (13 min. to 48 min.). Mating and oviposition periods overlapped in a particular case (The male continued to mate with the female during the oviposition period also). The highest number of matings observed in a pair was six. Mating period occupied an average of 2.20 days (Table 1). At the beginning of mating the male mounts the back of the female and starts violent lateral shakings of the abdomen. The female during copulation was often observed to expand the elytra slightly from time to time. Pre-oviposition, ovi-position and post ovi-position periods of female were found to be 1.25 days, 2.60 days and 7.60 days respectively. Average number of batches (ootheca) laid by a female was 2.60 with an

TABLE 1

DATA ON MATING AND OVIPOSITION OF FIELD
COLLECTED ADULTS OF *A. miliaris*

Observations	Mini- mum	Maxi- mum	Average
1. Mating period (days)	1	4	2.20*
2. Pre-oviposition period (days)	1	2	1.25
3. Oviposition period (days)	2	5	2.60
4. Number of ootheca laid (number)	2	6	2.60
5. Post-oviposition period ((days)	4	10	7.60
6. Fecundity (number of eggs)	124	219	171.50

* Average of 5 copulating pairs.

average fecundity of 171.50 eggs (Table 1).

II. *Observations on laboratory bred Beetles*

Grubs: The grub is carabiform with well developed, pigmented and dark brown coloured head. Mouth parts hypognathus, colour yellow except in the 1st instar, in which the colour is creamy white. Head partially concealed by the prothorax; Three pairs of 4 segmented thoracic legs with one claw present; circular spiracles present dorsolaterally (one pair on prothorax and 7 pairs on abdominal segments 1 to 7); 8th abdominal segment possesses a pair of curved, stiff non-segmented spines projecting dorsally; lateral aspects of thorax and abdomen with transparent filaments (1st instars) or multisetiferous scoli (II, III, IV and V instars); black spots present on dorsal surface of thorax and abdomen in all instars except 1st instar.

First Instar: The first instar grub after hatching emerges through the lower portion of the ootheca by biting minute holes. Creamy white in colour and without any spots on its body.

Lateral aspects of thorax and abdomen bears 20 transparent filaments. Grubs after hatching, wander about on the leaf surface for some time and then settle on the lower leaf surface and feed by scraping the chlorophyllous tissue from the lower epidermis. In the mass culture they were gregarious and fed in groups with the head towards the centre of the group. The first instar grub carries a palate of excreta on the stiff pair of spines on the 8th abdominal segment. The grub when teased twist the tip of the abdomen upwards and lower the spines with the excreta they carry. In all the three species of *Ipomoea* the duration of the first instar was found to be 2 days (Table 2). The first instar grub measured about 1.007 mm in length 0.434 mm in breadth.

Second Instar: After the first moult, the second instar grub carries the exuvium at the tip of the stiff pair of spines on the 8th abdominal segment. Colour of the second instar grub is yellow. Tiny black spots appear on the dorsal surface, thorax and abdomen. Number of spots on different segments are as follows. Prothorax-2 spots; mesothorax-4 big spots in first transverse row; abdomen with 5 spots on each of the segments from 1 to 7, arranged in five longitudinal rows (spots on the median line are very minute). Thirty two scoli with transparent spines occur on the lateral aspects of thorax and abdomen. In the second instar the stiff pair of caudal spine was more prominent with black tip and white base. Spiracles were pale white and circular. The grubs feed by scraping in the early part of second instar but late second instar grubs were also gregarious. Duration of the second instar was less (3.33 days) in *Ipomoea batata* in comparison to the other two species of *Ipomoea* (Table 2). The second instar grub measured 4.083 mm in length and 2.16 mm in breadth.

TABLE 2

LIFE HISTORY OF *A. miliaris* ON THREE SPECIES OF *Ipomoea* IN LABORATORY

	<i>Ipomoea angulata</i>			<i>Ipomoea palmata</i>			<i>Ipomoea batata</i>		
	Mini- mum	Maxi- mum	Average	Mini- mum	Maxi- mum	Average	Mini- mum	Maxi- mum	Average
Incubation period (days)	6	6	6.00	6	6	6.00	6	6	6
Larvae (days)									
I Instar	2	2	2.00	2	2	2.00	2	2	2
II Instar	4	5	4.33	4	5	4.33	3	4	3.33
III Instar	3	4	3.67	2	3	2.67	2	4	2.67
IV Instar	4	5	4.67	5	6	5.33	4	5	4.67
V Instar	5	7	6.33	7	7	8.00	6	7	6.33
Pre-pupal period (days)	2	2	2.00	1	2	1.33	1	1	1.00
Pupal period (days)	6	7	6.33	6	8	7.00	5	6	5.67
Adult longevity (days)									
Male	22	26	24.33	30	33	32.33	23	25	23.33
Female	30	34	31.66	36	39	38.67	28	31	29.66
Fecundity (number)	24	62	43.00	30	58	44.00	32	72	52.00

Third Instar: The third instar grub retained the exuvium of the first moult. The black spots became more conspicuous. Numbers of scoli were same as in the previous instar. During the early part of the instar the grub fed gregariously but later on they dispersed and fed singly by biting holes in the leaf. The grub had 12 black spots on the ventral surface of the abdomen. They fed voraciously on all the three species of *Ipomoea*. The third instar grub measured about 6.33 mm in length and 3.50 mm in breadth.

Fourth Instar: Exuvium of the third moult was also retained by the fourth instar grub just below the previous two exuviae. Grubs usually fed singly and voraciously. Armature and body coloration were same as in case of the third instar. The fourth instar grub measured about 10.58 mm in length and 5.41 mm in breadth.

Fifth Instar: Fifth instar grub retained the exuvium of the fourth moult below the exuviae of the earlier moults. Grubs were very voracious during this stage and fed singly. In

the mass culture, the grubs nibbled the petioles also. Armature and body coloration were same as that of 4th instar. The grubs shed all the exuvium but still a little exuvium sticks to the base of the stiff caudal spines (Vrogamphi). The fifth instar measured about 13.842 mm in length and 7.52 mm in breadth.

Pupa: *A. miliaris* pupates strictly on the lower surface of the leaf in field but in the laboratory they pupated on both the surfaces. Pupa firmly adheres its abdominal tip to the leaf surface. Freshly formed pupae were shining yellow in colour and without spots. Prothoracic shield was prominent and has four transparent spines on the cephalic margin. Each of the abdominal segments (1 to 5) bears laterally a pair of transparent scale like plates ending in a black spine. Black spots appear gradually on the body, with the thoracic spots appearing first and abdominal spots on pupae and varied according to their maturity. Before adult emergence, the number of spots on pupae are on prothorax-5 spots, 1st abdominal segment-4 spots (inner 2 spots bigger and

hexagonal) seventh abdominal segments-2 spots.

A part of the last exuvium may still remain on the tip of the abdomen in pupa. The stiff pair of caudal spines remains in the pupae in exarate. Pupal period on different *Ipomoea* species are presented in Table 2. Female pupae were bigger in size than male pupae with no difference in number of spots. The male and female pupae measured 10.50 mm and 11.25 mm in length and 8.00 mm and 9.12 mm in breadth respectively.

Adult: Freshly emerged adult beetles are light pinkish in colour with transparent elytra having faint spots. Gradually the spots become darker. Colour of the elytra gradually changes to yellow and then reddish yellow after about 15 days of emergence. Males were smaller than the females. Females were more or less round in shape but the males were somewhat elongate or oval in shape. Prothoracic shield completely covers the head of the adult beetle. Head hypognathus and antennae capitate with black tip. Prothoracic shield has one black spot in the middle. Two big irre-

gular margin black spots were present on the transparent margin of each elytra. The distal tip of each elytra also possesses a square shaped black spot. Besides there were three spots on the margin, each elytra possesses 12 more spots. In general each elytra possesses 15 spots. Adults feed by biting holes on both the surfaces of leaves. The legs were yellow in colour. The adult male and female measured about 12.167 mm in length and 10.50 mm in breadth and 14.167 mm in length and 11.91 in breadth respectively. The longevity of adult male and female are presented in Table 2.

Fecundity: On all the three species of *Ipomoea* the female laid 2 ootheca. Average number of eggs laid in three different species of *Ipomoea* were 43, 44 and 52 in *I. angulata*, *I. palmata* and *I. batata* respectively.

III. Leaf area consumption studies on *Ipomoea angulata*:

The first, second, third, fourth and fifth instar grubs and adults of males on an average consumed 0.26 ± 0.14 , 0.46 ± 0.41 , 0.68 ± 0.37 , 0.66 ± 0.49 , 1.51 ± 0.51 and 10.70 ± 0.67 sq.

TABLE 3
LEAF AREA CONSUMED BY DIFFERENT INSTARS AND ADULTS OF *A. miliaris* ON *I. angulata*

Stages	Period in days			Leaf area consumed (sq. cm.)			
		Minimum	Maximum	Mean	Minimum	Maximum	Mean
First Instar	Male	2	2	2±0	0.22	0.31	0.26±0.14
	Female	2	2	2±0	0.15	0.25	0.20±0.11
Second Instar	Male	2	3	2.60±0.86	0.30	0.60	0.46±0.41
	Female	2	3	2.4 ±0.86	0.20	0.50	0.36±0.43
Third Instar	Male	2	4	2.8 ±0.45	0.56	0.90	0.68±0.37
	Female	2	4	3.0 ±0.50	0.30	0.80	0.75±0.48
Fourth Instar	Male	3	6	4.8 ±1.22	0.50	0.95	0.66±0.49
	Female	3	6	4.8 ±1.22	0.35	0.91	0.57±0.45
Fifth Instar	Male	6	7	6.4 ±0.86	1.30	1.90	1.51±0.51
	Female	6	7	6.6 ±0.83	0.60	1.65	1.36±0.64
Adult	Male	20	24	22.60±1.17	10.35	11.35	10.70±0.67
	Female	22	26	24.60±1.34	8.8	10.71	10.04±0.77

cm leaf area respectively, whereas that of 0.75±0.48, 0.57±0.45, 1.36±0.64, 10.04± female consumed 0.20±0.11, 0.36±0.43, 0.77 sq. cm leaf area respectively.

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29. A STUDY ON THE EFFECTS OF CERTAIN ABIOTIC FACTORS ON THE ACTIVITY OF *MYLLOCERUS LAETIVIRENS* NABL. (COLEOPTERA: CURCULIONIDAE)

INTRODUCTION

Myllocerus laetivirens is a very serious pest of trees and plants. Its ecology has not been studied so far. An attempt has been made here to find out the correlation between the yearly activity of this beetle with certain abiotic factors at Pilani (Rajasthan).

MATERIAL AND METHODS

The beetle was caught with the help of Pilani type light trap (Kundu *et al.* 1961) operated daily for two years (1976-1977) from dusk to dawn at Pilani (Pilani is on the North-eastern side of Jhunjhunu District of Shekha-

wati region in semi-arid zone of Rajasthan, India, Its geographic position is 28°20'N latitude and 75°35'E longitude and 330 msl.)

The dependent factor, i.e. the yearly activity of *M. laetivirens* has been correlated with the various independent abiotic factors, i.e. 8.30 A.M. relative humidity, 5.30 P.M. relative humidity, minimum temperature, maximum temperature, mean temperature and rainfall. In order to achieve this, regression analysis, partial regression analysis, multiple regression analysis and Beta coefficient analysis has been conducted.

The numbers of all the captures of *M.*